



Radar interferometry for measuring regional-scale processes

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Radar interferometry (InSAR) is a very effective technique for measuring surface displacements in some instances, but its use remains limited for the measurement of regional scale processes, such as for postseismic/interseismic motion. In many instances the signal over much of an image either decorrelates too quickly to be useful, or is swamped by atmospheric signal. Time series InSAR methods address the decorrelation issue by increasing the signal-to-noise ratio through the use of more data. To some extent, atmospheric signal can also be reduced, although on a regional scale the influence can still be significant, especially when the strain rates detected at the surface are low. We have developed a technique to further reduce the tropospheric part of the atmospheric signal, which is the most significant part for C-band and X-band instruments. We use the correlation of this signal with topography and account for lateral variation by estimating the relationship locally. We avoid incidental subtraction of any deformation signal by using only spatial frequencies where the deformation is insignificant in the estimation process. To reduce remaining long wavelength errors, due chiefly to ionospheric signal, and orbit errors we have developed integration strategies that take advantage of other geodetic data acquired in the region of interest, such as GPS. We demonstrate our improved techniques for measuring interseismic motion in western Anatolia and the 2006 subduction slow-slip event in Guerrero, Mexico.